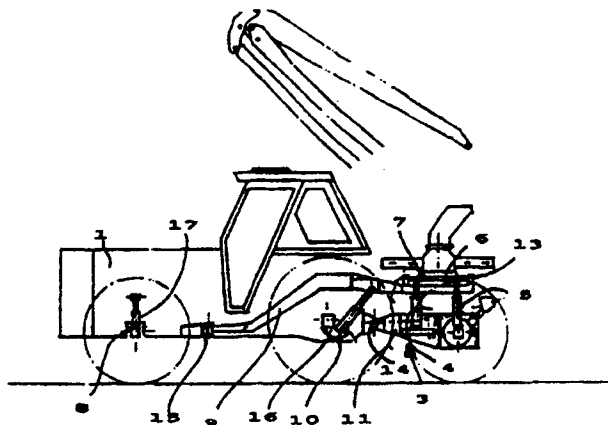




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/FI95/00496 (22) International Filing Date: 13 September 1995 (13.09.95) (71)(72) Applicant and Inventor: KORHONEN, Kosti [FI/FI]; Mustalampi, FIN-71480 Kurkimäki (FI). (74) Agent: PITKÄNEN, Hannu; Pitkänen Oy, Savilahdentie 6 L 3, FIN-70210 Kuopio (FI).	(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TT, UA, US, UZ, VN, ARIPO patent (KE, MW, SD, SZ, UG), European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  Published With international search report. In English translation (filed in Finnish).	

(54) Title: IMPLEMENT MOUNT ACCESSORY FOR A VEHICLE



## (57) Abstract

The present invention is related to an implement mount accessory for a vehicle, comprising an auxiliary axle (3) in the vertical direction rotatably adapted close to the axle of the vehicle (1), actuator cylinders (4, 5) connected to said auxiliary axle and an implement mount platform (6) rotatably attached to said auxiliary axle (3) by means of an implement mounting part (7) connected to said actuator cylinders. For keeping the implement essentially horizontal said accessory comprises, connected directly to or in the immediate vicinity of such one axle of the powering vehicle which is farther away from said auxiliary axle, a frame (9) which is adjustable in the vertical direction relative to the vehicle and to which frame said mounting part (7) is connected rotatably in the lateral direction relative to the vehicle. Thereby the lateral position of the mounting part with the implement connected thereto is determined by the cooperation of the positions of auxiliary axle (12) and the vehicle axle closer to or farther away from the implement, while the longitudinal horizontal position of the mounting part (7) is determined by the mutual relationship of cooperation of the auxiliary axle (3) and the vehicle axle (2) closer to the implement and of the vertical position of the second axle of the vehicle farther away from the auxiliary axle.

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### Implement mount accessory for a vehicle

The present invention is related to an implement mount accessory for a vehicle, said accessory comprising an auxiliary axle in the vertical direction rotatably adapted close to the axle of the vehicle, actuator cylinders connected to said auxiliary axle and an implement mount platform rotatably attached to said auxiliary axle by means of an implement mounting part connected to said actuator cylinders.

For operation, different kinds of implements such as cranes, bucket excavators and other tools are attached to vehicles. When moving such vehicles with the attached implements in rough terrain, a problem arises therefrom that the implement can shift notably in the vertical and lateral directions, whereby the optimal transfer or working position is lost. No matter how urgent the need of weight distribution between the different axles, the construction of vehicles often prevents such corrective adjustment.

A number of various arrangements are known in the art that can attenuate undesirable movements of attached implements and similar connected tools and that aim at keeping such implements/tools horizontal also during the transfer of the vehicle and use thereof in rough terrain. Such arrangements are complicated and generally integrated with the vehicle construction, making them unsuitable for position compensation of implements attached to the vehicle. When adapted for use with detachable implements, the constructions of vehicles must be modified, which generally requires a compromise in other performance qualities of the vehicle. An additional disadvantage is that high local stresses are imposed on the attachment point of the implement.

It is an object of the present invention to provide a detachable implement mount accessory for a vehicle, said accessory being capable of overcoming the disadvantages of conventional accessories. It is a further object of the invention to provide an accessory capable of keeping the implement essentially horizontal during transport and operation. It is still a further object of the invention to achieve an accessory, whose use does not require dismantling or modification of the basic structure of the powering vehicle and whose operation imposes an evenly divided load on the structures of the powering vehicle and permits distribution of equipment weight on the different axles of the vehicle in a desired manner.

The goal of the invention is achieved by virtue of an accessory characterized by what is stated in the annexed claims.

According to the invention, the accessory comprises, attached to one axle of the powering vehicle or in the immediate vicinity thereof, a frame which is adjustable in the vertical direction relative to the vehicle and to which frame the mounting part of the frame is connected rotatably in the lateral direction relative to the vehicle. Then, the lateral position of the mounting part with the implement connected thereto is determined by the cooperation of the positions of the auxiliary axle and the vehicle axle closer to or farther away from the implement, while the longitudinal horizontal position of the mounting part is determined by the mutual relationship of the cooperation of the auxiliary axle and the vehicle axle closer to the implement and of the vertical position of the second axle of the vehicle. The frame according to the invention makes it possible to adjust the implement mount platform with the implement attached thereto so that the implement stays essentially horizontal during transport and working in both the lateral and

longitudinal directions. Furthermore, the frame facilitates distribution of equipment weight in a desired manner between the axles.

5 In a preferred further embodiment of the invention, the frame is extended on both sides of the powering vehicle up to the second axle or to the close vicinity thereof. By virtue of such a structure, the weight load imposed by the implement can be distributed over several points of  
10 the powering vehicle chassis. The frame of the implement proper can be connected to the powering vehicle with the help of relatively small adapter elements, whereby no changes in the vehicle structures are necessary. The adapter elements are such that cause no disturbance to  
15 other use of the vehicle.

In a preferred embodiment of the invention, the accessory incorporates actuator cylinders connected to the vehicle and the mount frame for, e.g., an excavator, whereby the  
20 cylinders serve for adjusting the position of the implement mount frame. Then, the frame, and thereby, the position of the implement can be adjusted in a desired manner for keeping the implement such as an excavator horizontal and for distributing the imposed weight load  
25 between desired axles.

In a preferred further embodiment of the invention, one first pair of cylinders are connected at their lower ends to the frame of the auxiliary axle assembly, while  
30 respectively, a second pair of cylinders are connected at their lower ends to the axle of the auxiliary axle assembly. These cylinders provide effective control of implement position.

35 In a further embodiment of the invention, the implement mounting part is advantageously pivotally connected by pins to the vehicle chassis. Such locking pins offer a

simple and highly functional method of implement connection.

5 In the following, the invention will be examined in more detail with reference to the attached drawings in which

Figure 1 is a side view of an embodiment of an implement mount accessory according to the invention attached to a tractor;  
10

Figure 2 is a top view of the accessory and tractor combination shown in Fig. 1;

15 Figure 3 is a rear view of the accessory shown in Fig. 1;

Figures 4 and 5 are side and top views, respectively, of another embodiment of the accessory according to the invention as connected to a tractor;  
20

Figures 6 and 7 are side views of an embodiment of the accessory according to the invention, here connected to a tractor and set in its working position;

25 Figure 8 is a side view of an embodiment of the accessory according to the invention, here connected to a tractor and set in its working and/or transport position;

Figure 9 is a side view of an accessory according to the invention, here connected to a tractor and set in its transport position;  
30

Figure 10 is a side view of a fourth embodiment of the accessory according to the invention, here connected to a tractor; and  
35

Figures 11-13 are side, rear and top views, respectively, of an accessory according to the invention, here connected to a tractor.

5 Referring to Figs. 1-3, while the application of the accessory shown therein has an implement, namely, an excavator mounted on a tractor 1, alternative applications may be found for other kinds of implement-and-vehicle combinations. The accessory incorporates an  
10 auxiliary axle assembly 3, actuating cylinders 4, 5 connected thereto, an implement mounting part 7 to which the cylinders are connected, and attached to the mounting part, an implement platform 6 on which the implement proper is mounted. The frame 11 of the auxiliary axle  
15 assembly is rotatably adapted to an eyelet 14 which is located at the rear of the tractor. The accessory further incorporates an excavator frame 9 which is designed to extend to both sides of the powering tractor and is connected at its ends to the tractor by connecting eyelets  
20 15 located close to the tractor front axle 8. At the rear axle 2, the tractor is provided with a third set of eyelets 16, and the position adjustment cylinders 10 of the excavator frame 9 are connected to both these third eyelets and the excavator frame. The excavator frame is  
25 arranged to reach below the implement mounting part 7 and the mounting part is connected sideways rotatably by means of pins 13 to the excavator frame.

The cylinders 4 actuating on both sides of the implement  
30 mounting part are connected at their lower ends to the frame 11 of the auxiliary axle assembly, while the other cylinders 5 are connected at their lower ends to the axle 12 of the auxiliary axle assembly. The axle 12 is connected sideways swingingly to the frame 11 of the auxiliary axle assembly. For controlling the swing of the front  
35 axle 8, the accessory further incorporates a pair of

cylinders 17 which are located close to the front axle and are arranged to actuate the front axle.

Referring to Figs. 4 and 5, another embodiment of the  
5 implement mount accessory according to the invention is shown therein. While the accessory is also in this application connected to a tractor, here the mounting eyelet 14 is located in front of the tractor, in the immediate vicinity of the front axle 19, and the excava-  
10 tor frame 9 is connected by its other end to mounting eyelets 15 which in turn are attached to the rear axle 20 of the tractor. Further, the hydraulic cylinders serving to control the excavator frame are located to the front of the tractor, below a cross-directional support 18  
15 joining the different members of the excavator frame. Otherwise, the accessory construction is similar to the above-described first embodiment.

The hydraulic cylinders used to steer the operation of  
20 the accessory are controlled with the help of conventional directional valves and other hydraulic pressure control and adjustment devices integrated with the construction of the accessory, whereby the accessory can be inclined in a desired direction for keeping the platform  
25 of the implement essentially horizontal and distributing the equipment weight on desired axles. For transferring the tractor with the implement, the cross-directional position of the implement mount accessory and the powering vehicle are adjusted by means of the hydraulic cylinders 4, 5 as required by the movements of the axle assemblies and the auxiliary axle closer to the implement, or  
30 alternatively, farther away from accessory, while the longitudinal position is respectively adjusted according to the position of said axle assemblies and the vertical position of the other axle of the powering vehicle.

35 A number of such corrective actions are required for working in the terrain during equipment transfer, working



in the terrain, crossing terrain obstacles and point-to-point hauling, and when the equipment weight has to be balanced between the axles in a desired manner.

5 Referring to Figs. 6-9, vehicles with implements are shown in different positions. In Fig. 6 is shown a vehicle with its weight resting on its front wheels and the wheels of the auxiliary axle. The implement is shown  
10 adjusted into a horizontal position, whereby its operation is maximally efficient. The auxiliary axle may be used in the illustrated manner for crossing ditches and similar excavations of varying sizes.

15 In the working position shown in Fig. 7, the wheels of the auxiliary axle are supported on the edges of the ditch and the frame of the auxiliary axle is in an inclined position. The implement is adjusted into an essentially horizontal position to make its operation easier.

20 In Fig. 8 the vehicle and the implement are shown in a position which may be used as both a working position and a transfer position. Fig. 9 in turn shows the auxiliary axle elevated, whereby this position can be used for  
25 transfer of the implement-vehicle combination.

Referring to Fig. 10, the application shown therein has the frame 9 pivotally connected by means of a pivotal joint 21 to a support 22 placed below the implement  
30 mounting part 7. The mounting part 7 is pivotally connected by pins to this support. Furthermore, the implement mount accessory incorporates cylinders 23 connected to the frame 9 by their one ends and by their other ends to a projection made to said support 22. In this applica-  
35 tion, the auxiliary axle can be adjusted by its vertical position independently from the position of the frame 9. Hereby, the longitudinal horizontal position can be

achieved over a wider vertical position range of the auxiliary axle using a shorter stroke of the cylinders. The auxiliary axle can herein be swung with respect to the frame, whereby the boom system of the implement is prevented from hitting on the tractor cabin under different working conditions. Also implements located in front of the powering vehicle can be provided with a similar arrangement in which the auxiliary axle assembly is pivotally connected to the frame.

Referring to Figs. 11-13, in the simplified embodiment of the invention shown therein, the rear part of the frame 9 comprises a stiff plate laterally tapered toward its end. The structure of the implement mounting part in this application has a shape equivalent to a piece of plate as if cut off from the planar section of the frame 9, whereby the mounting part is adapted sideways pivotal about a pin 13 placed in the center of the mounting part. In this construction, the lateral swing of the auxiliary axle 12 is arranged to occur concentrically with the pin 13. The upper ends of the cylinders 4, 5 are in this application connected to the excavator implement. The first cylinder 4 is connected at its lower end to the plate 9, while the lower end of the other cylinder 5 is connected to a lug formed on the axle. The frame structure shown in Fig. 10 is also applicable to this construction.

Not limited by the exemplifying embodiment described above, the invention may be varied within the scope and spirit of the annexed claims.

## Claims:

1. An implement mount accessory for a vehicle, comprising an auxiliary axle (3) in the vertical direction rotatably adapted close to the axle of the vehicle, actuator cylinders (4, 5) connected to said auxiliary axle and an implement mount platform (6) rotatably attached to said auxiliary axle (3) by means of an implement mounting part (7) connected to said actuator cylinders, c h a r a c -  
t e r i z e d in that said accessory comprises, connected directly to or in the immediate vicinity of such one axle of the powering vehicle which is farther away from said auxiliary axle, a frame (9) which is adjustable in the vertical direction relative to the vehicle and to which frame said mounting part (7) is connected rotatably in the lateral direction relative to the vehicle, whereby the lateral position of the mounting part with the implement connected thereto is determined by the cooperation of the positions of auxiliary axle (12) and the vehicle axle closer to or farther away from the implement, while the longitudinal horizontal position of the mounting part (7) is determined by the mutual relationship of cooperation of the auxiliary axle (3) and the vehicle axle (2) closer to the implement and of the vertical position of the second axle of the vehicle farther away from the auxiliary axle.
2. An implement mount accessory as defined in claim 1, c h a r a c t e r i z e d in that said accessory incorporates actuator cylinders (10) connected to the vehicle and the frame (9) for adjusting the position of the implement mount frame.
3. An implement mount accessory as defined in claim 1 or 2, c h a r a c t e r i z e d in that the cylinders (4) are connected at their lower ends to the frame (11) of the auxiliary axle assembly.

4. An implement mount accessory as defined in any of claims 1-3, characterized in that the cylinders (5) are connected at their lower ends to the axle (12) of the auxiliary axle assembly.

5

5. An implement mount accessory as defined in any of claims 1-4, characterized in that said implement mounting part is rotatably attached by pins (13) to the frame (9).

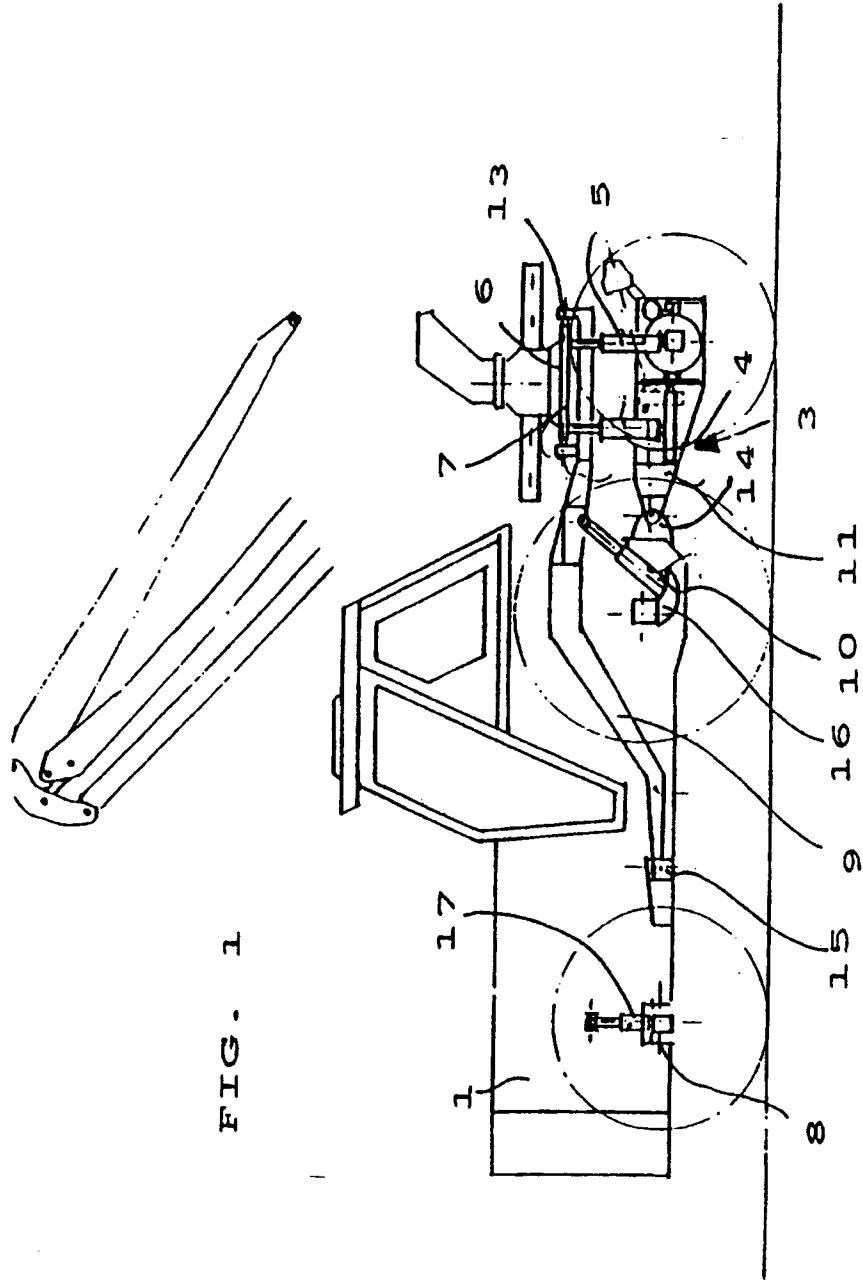
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6. An implement mount accessory as defined in any of claims 1-5, characterized in that the frame (9) is extended on both sides of the vehicle up to the other axle of the vehicle or in the vicinity thereof.

15

7. An implement mount accessory as defined in any of claims 1-6, characterized in that the rear part of the frame (9) is planar and that the planar-shaped implement mounting part (7) is adapted sideways pivotal about a pin (13) relative to the frame.

20



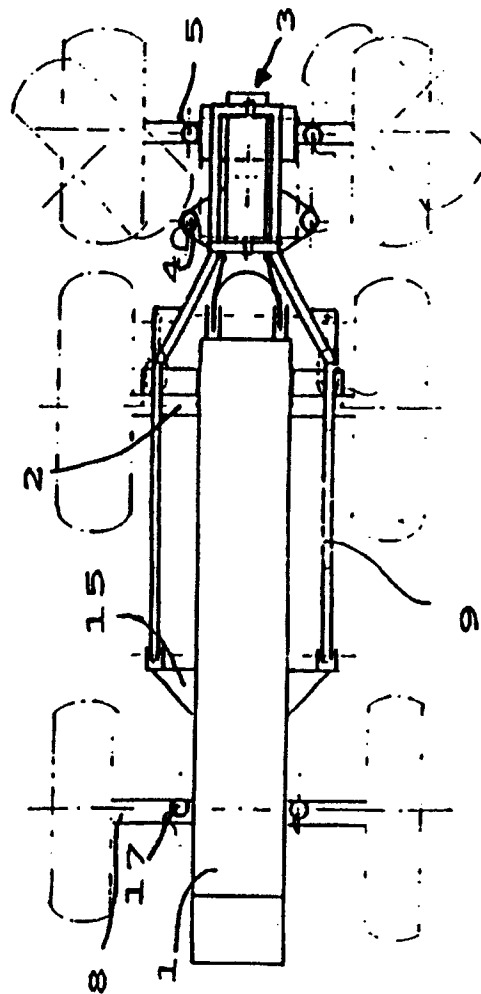


FIG. 2

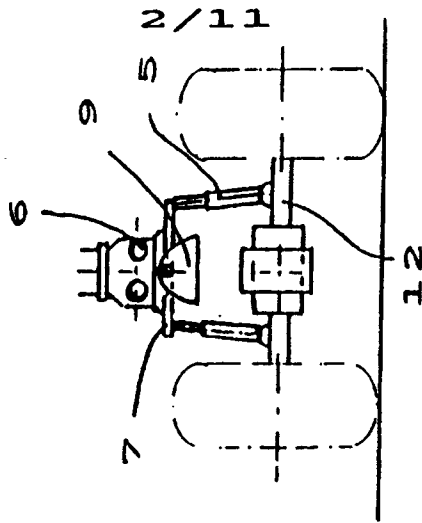


FIG. 3

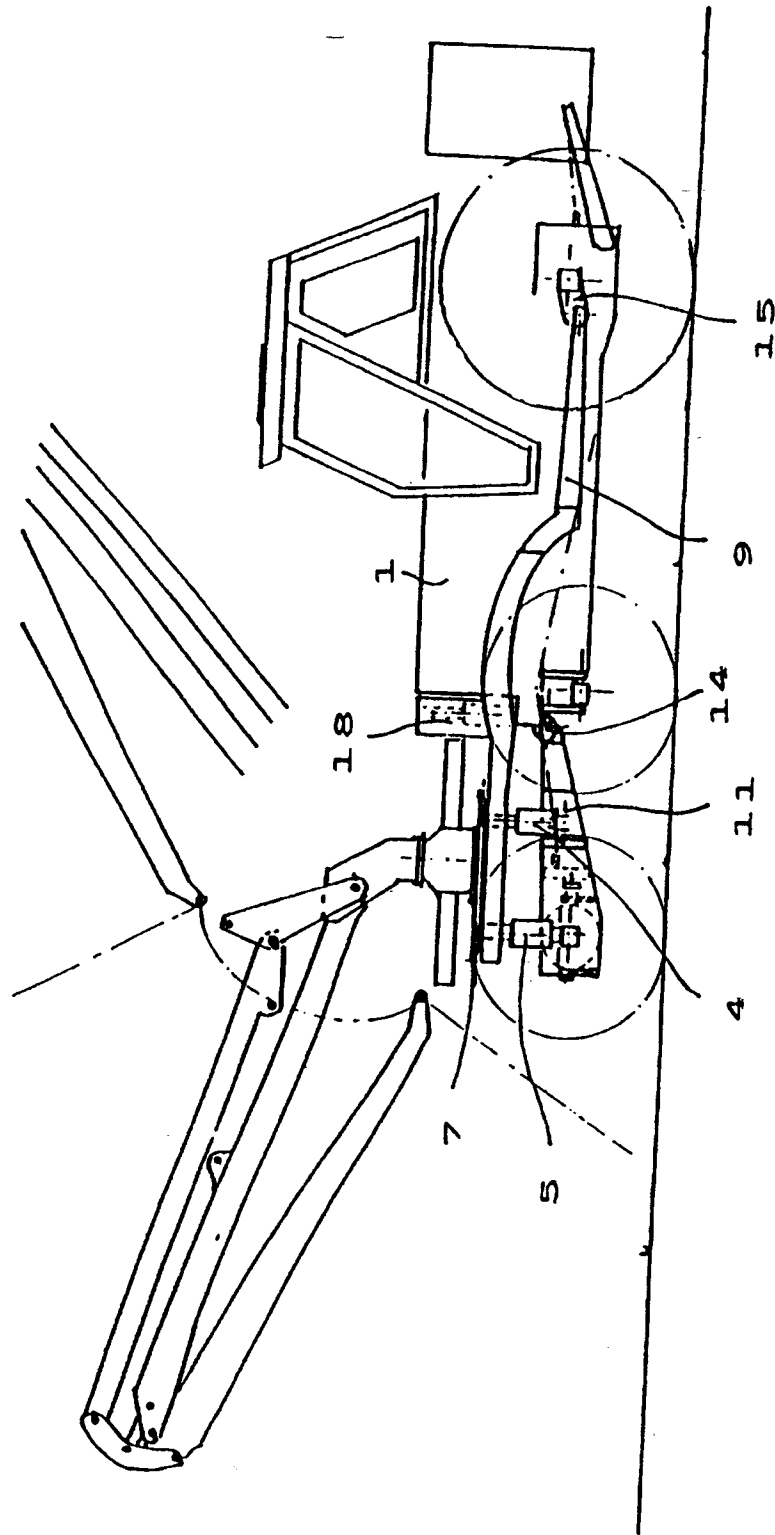


FIG. 4

FIG. 5

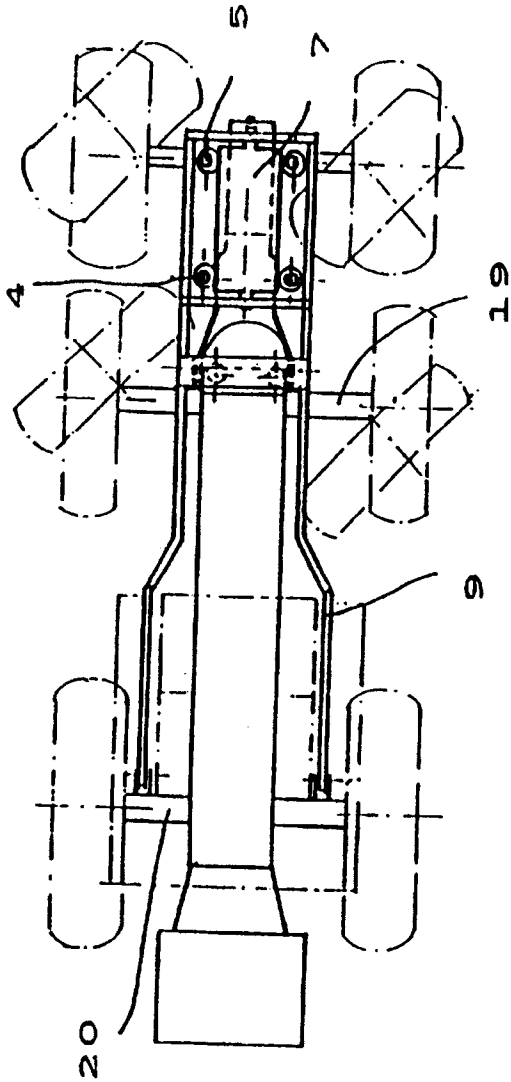




FIG. 6

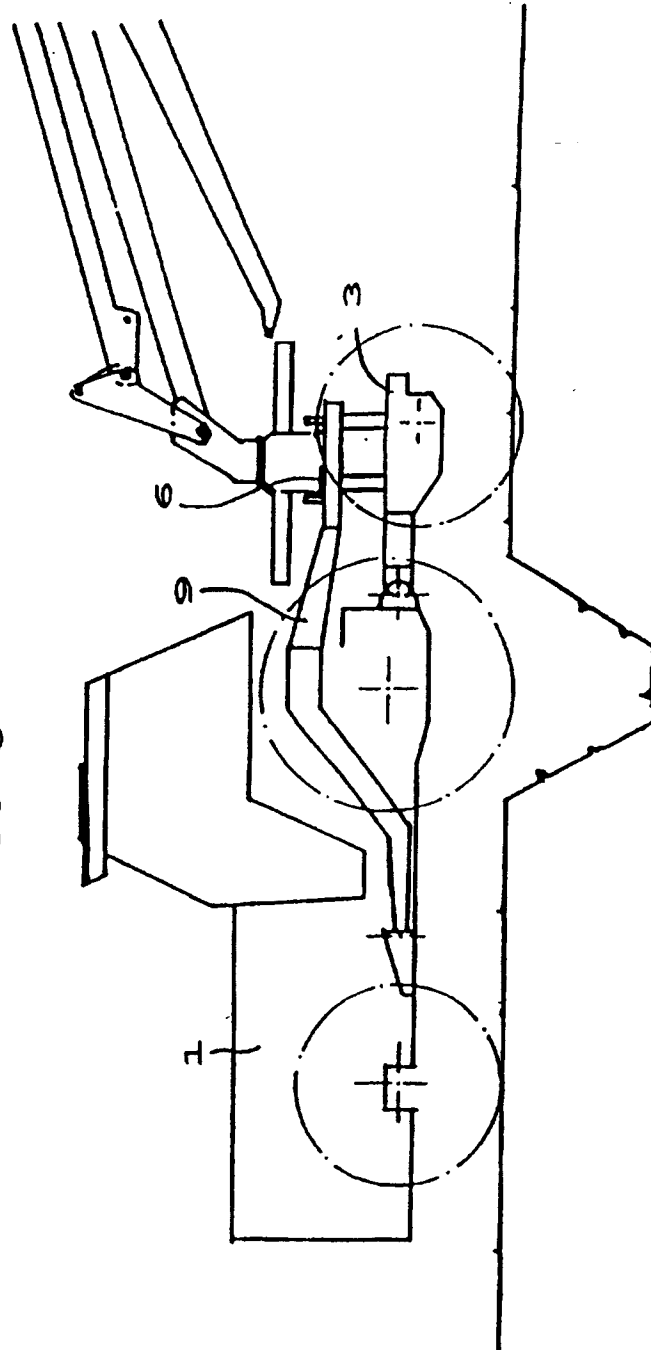


FIG. 7

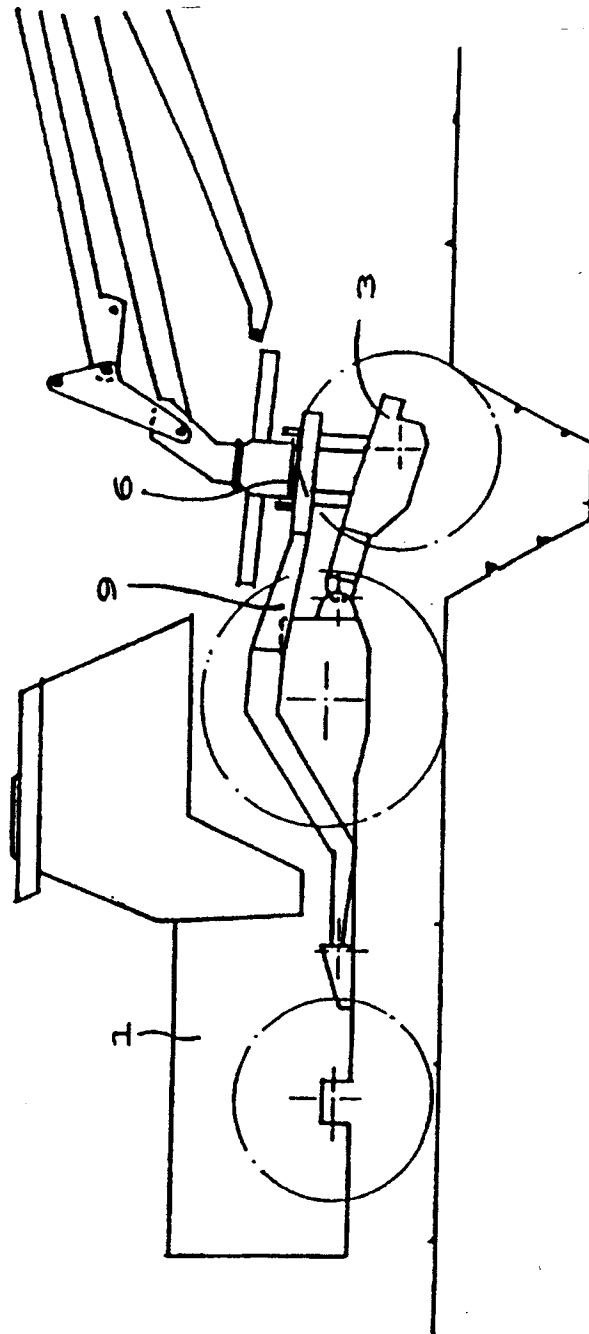
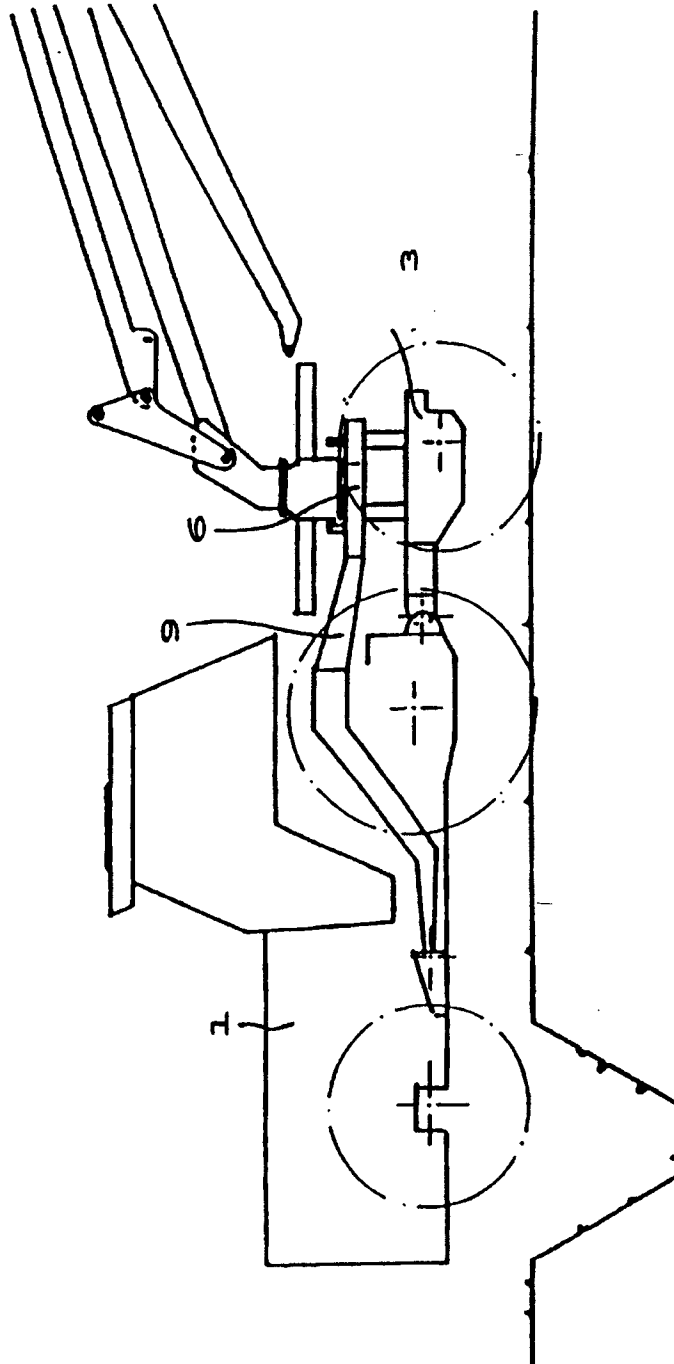
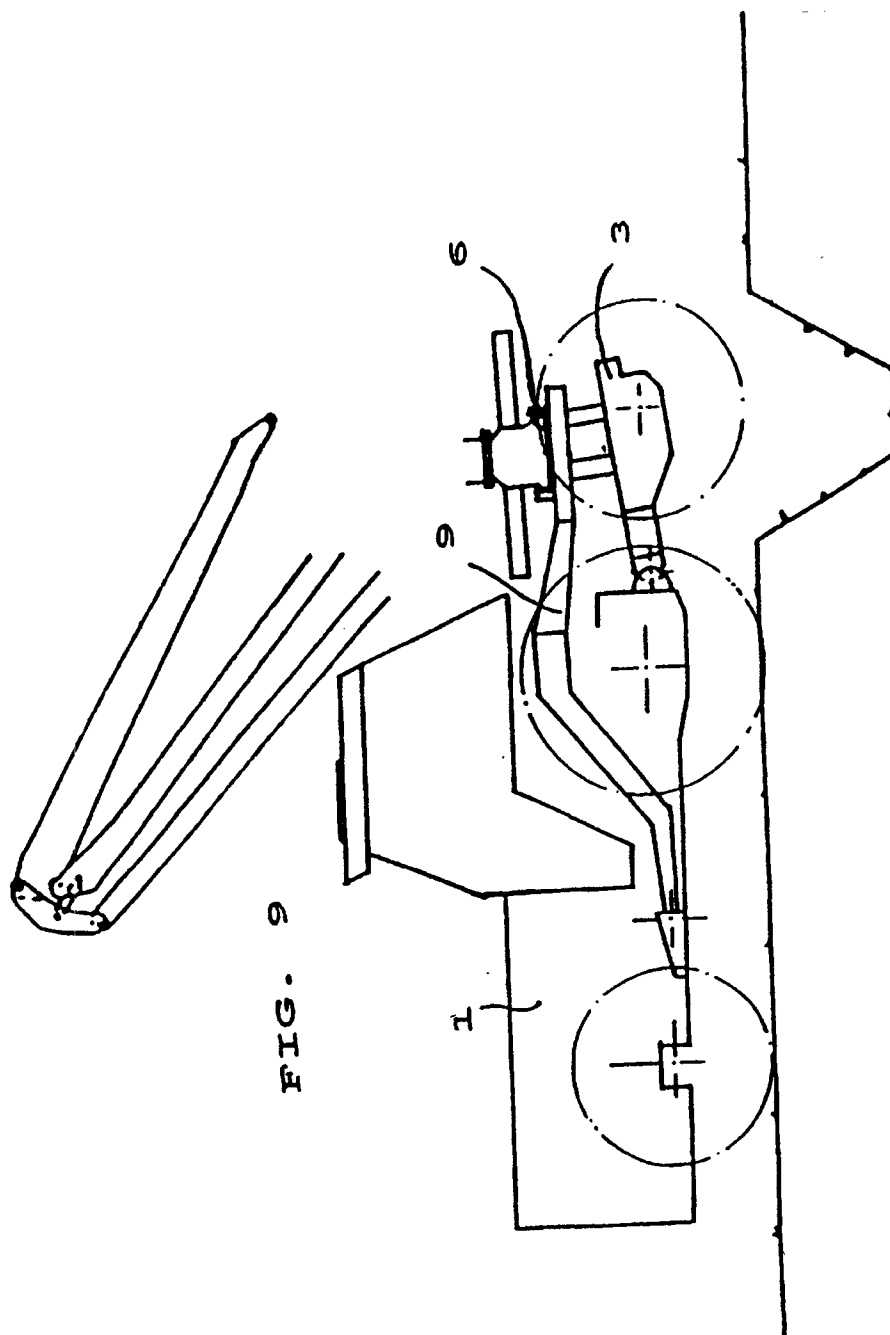


FIG. 8





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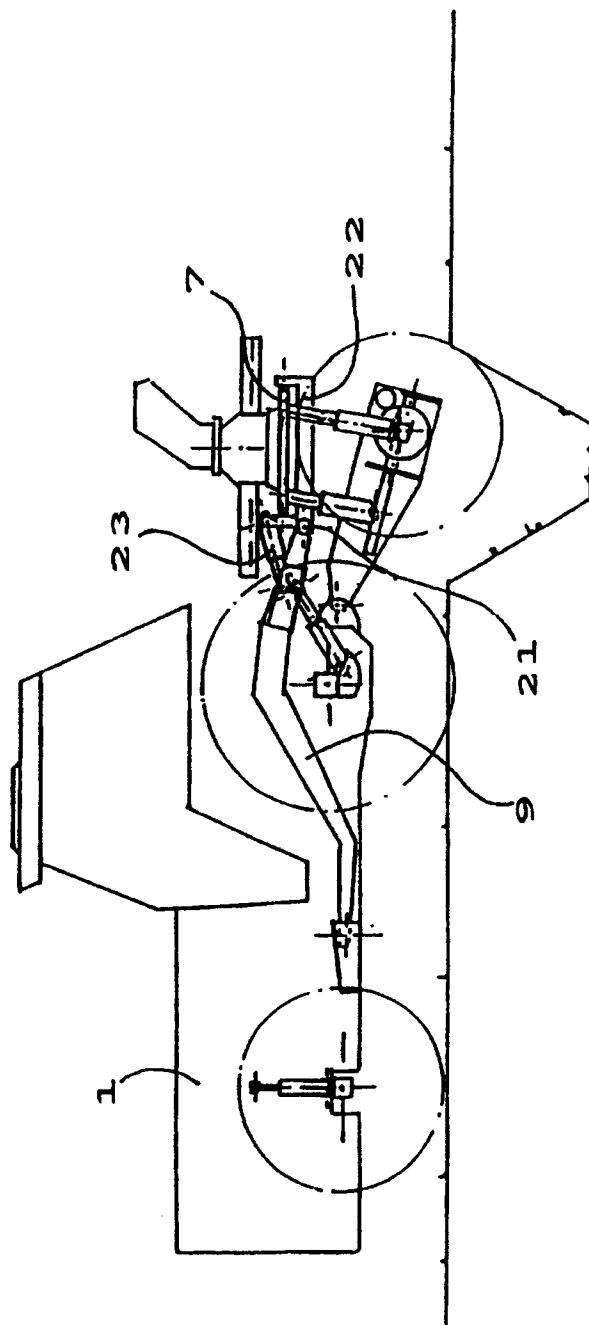


Fig. 10

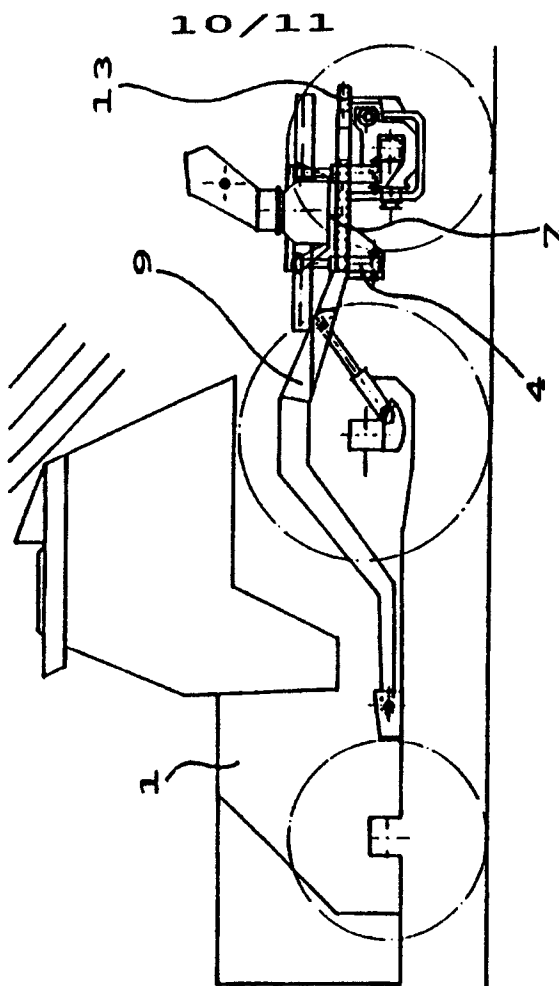


FIG. 11

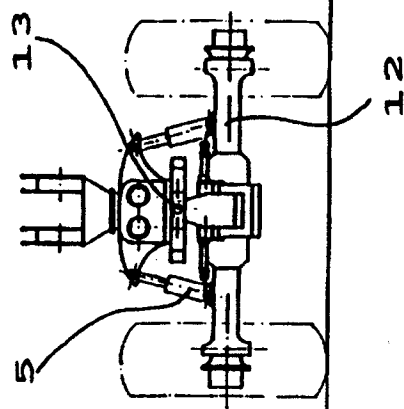


FIG. 12

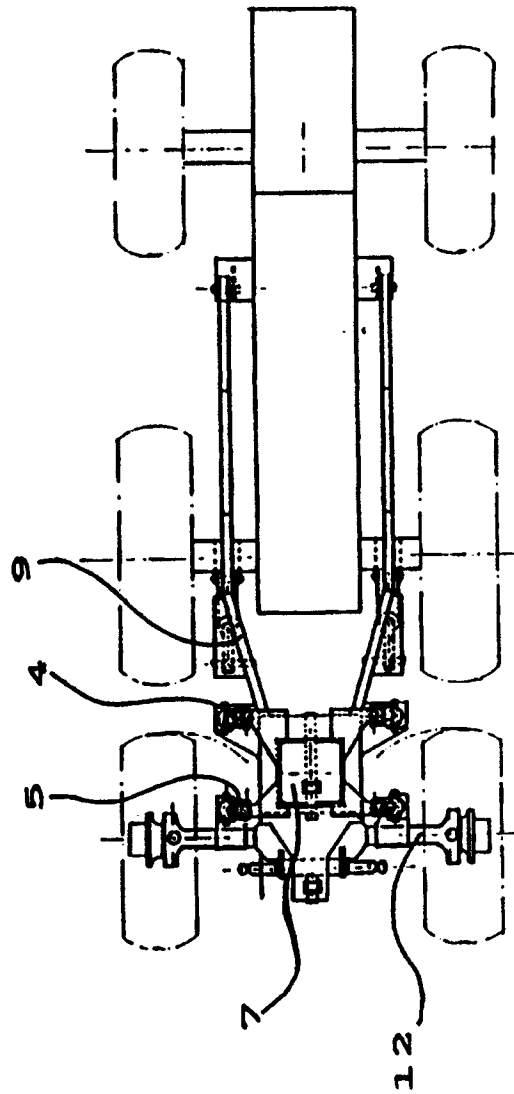


FIG. 13

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 95/00496

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B62D 53/00, E02F 9/02

According to International Patent Classification (IPC) or to both national classification and IPC

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Minimum documentation searched (classification system followed by classification symbols)

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 1907164 B2 (SOCIETE ANONYME POCLAIN), 23 October 1969 (23.10.69), column 2, line 60 - column 3, line 8, figures 1-2 --	1-7
A	EP 0003655 A1 (DODGSON, JOHN RICHARD), 22 August 1979 (22.08.79), figure 1, abstract --	1-7
A	EP 0594160 A1 (HEITZLER, KARL), 27 April 1994 (27.04.94), figure 1, abstract -- -----	1-7

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Date of the actual completion of the international search

24 April 1996

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Authorized officer

Kenneth Gustafsson

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01/04/96

International application No.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-B2- 1907164	23/10/69	BE-A, A- 770528 FR-A- 1584249 GB-A- 1233622	01/12/71 19/12/69 26/05/71
EP-A1- 0003655	22/08/79	GB-A- 1596315	26/08/81
EP-A1- 0594160	27/04/94	NONE	

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